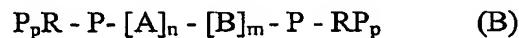
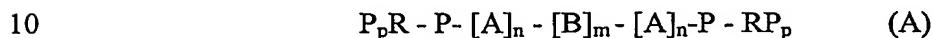


**Claims**

1. A process for the removal of multivalent metal cations from an aqueous system, wherein said aqueous system is treated with a high molecular weight non-ionic surfactant comprising anionic groups or salts thereof, preferably terminal anionic groups and salts thereof, wherein said high molecular weight non-ionic surfactant comprising anionic groups or salts thereof is represented by formula A or formula B:



wherein:

15 P is a mono-valent oxygen containing anionic group or a salt thereof selected from the group consisting of oxides of carbon, sulphur and phosphorus;

p is in the range of 1 to 4;

R is a linear or branched, saturated or unsaturated C<sub>2</sub> - C<sub>12</sub> alkylene group;

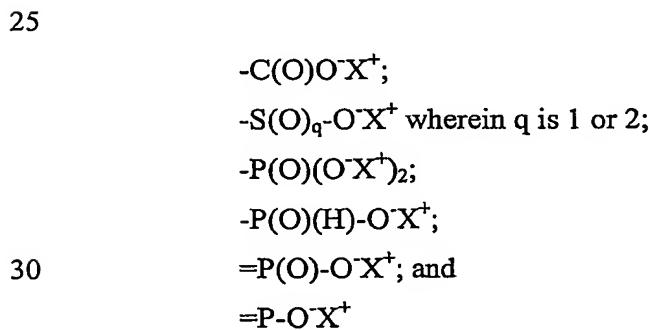
A is ethylene oxide;

20 B is propylene oxide;

n is in the range of 5 to 1000; and

m is in the range of 5 to 1000.

- 25 2. The process according to Claim 1, wherein the oxides of carbon, sulphur and phosphorus are selected from:



wherein X is independently selected from hydrogen, an alkali metal, an ammonium group  $\text{NR}'_4^+$  wherein R' is independently selected from hydrogen or linear or branched C<sub>1</sub>-C<sub>4</sub> alkyl groups, or two X's are an alkaline earth metal.

- 3. The process according to Claim 1 or Claim 2, wherein the groups P are terminal  
5 mono-valent oxygen containing anionic groups or salts thereof.
- 4. The process according to Claim 3, said surfactant being characterised by the  
following general formula (I) or (II) or (III):



10 (I)



(II)

15 Z-R-Z-[\text{A}]\_n-[\text{B}]\_m-[\text{A}]\_n-Z-R-Z

(III)

wherein:

X is hydrogen or an alkali metal, preferably lithium, sodium or potassium, or an  
20 ammonium group  $\text{NR}'_4^+$  wherein R' is independently selected from hydrogen or linear or branched C<sub>1</sub>-C<sub>4</sub> alkyl groups, or two X's are an alkaline earth metal, preferably magnesium or calcium;

R is a linear or branched, saturated or unsaturated C<sub>2</sub> - C<sub>12</sub> alkylene group;

A is ethylene oxide;

25 B is propylene oxide;

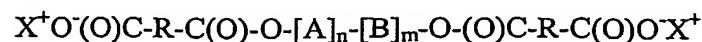
n is in the range of 5 to 1000;

m is in the range of 5 to 1000;

q is 1 or 2; and

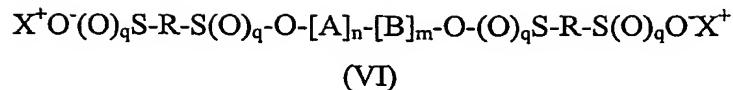
wherein Z is independently selected from phosphonate or phosphinate.

- 30 5. The process according to claim 3, said surfactant being characterised by the  
following general formula (IV) or (V) or (VI):

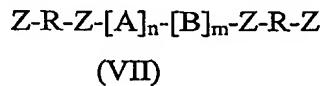


20

(V)



5



wherein:

- 10        X is hydrogen or an alkali metal, preferably lithium, sodium or potassium, or an ammonium group  $NR'^4+$  wherein R' is independently selected from hydrogen or linear or branched C<sub>1</sub>-C<sub>4</sub> alkyl groups, or two X's are an alkaline earth metal, preferably magnesium or calcium;
- 15        R is a linear or branched, saturated or unsaturated C<sub>2</sub> - C<sub>12</sub> alkylene group;
- 15        A is ethylene oxide;
- 15        B is propylene oxide;
- 20        n is in the range of 5 to 1000;
- 20        m is in the range of 5 to 1000;
- 20        q is 1 or 2; and
- 20        wherein Z is independently selected from phosphonate or phosphinate.
- 25        6. The process according to Claim 4 or Claim 5, wherein X is hydrogen or an alkali metal, preferably sodium or potassium.
- 25        7. The process according to any one of Claims 4 - 6, wherein R is a linear and saturated C<sub>2</sub> - C<sub>6</sub> alkylene group.
- 25        8. The process according to Claim 7, wherein R is ethylene.
- 25        9. The process according to any one of the preceding Claims, wherein n is in the range of 10 to 100.
- 25        10. The process according to any one of the preceding Claims, wherein m is in the range of 10 to 100.
- 30        11. The process according to any one of Claims 1 - 10, wherein said process comprises decreasing the hardness of said aqueous system
- 30        12. The process according to any one of claims 1 - 11, wherein said process comprises an industrial or a domestic wash process.

13. The process according to any one of Claims 1 – 12, wherein the temperature of said aqueous system is 0 - 200°C.
14. A process for the removal of multivalent metal cations from an aqueous system, wherein said multivalent metal cations are contacted at a first temperature with  
5 and thermo-reversibly bonded to a high molecular weight non-ionic surfactant comprising anionic groups or salts thereof, preferably terminal end groups or salts thereof to form a cation-surfactant complex, and wherein said cation-surfactant complex is subjected to a second temperature, the second temperature being lower than the first temperature, to release said multivalent metal cations from  
10 said high molecular weight non-ionic surfactant comprising anionic groups or salts thereof, preferably terminal anionic groups or salts thereof.